CHEM 552 – CHEMICAL BIOLOGY

Fall 2018

Course description:

This course examines biological problems from a chemical and structural perspective. The structural and functional properties of amino acids, nucleotides, and sugars will be presented. This is followed by a discussion of the structural and thermodynamic aspects of the organization of these molecules into higher-order structures, such as proteins, nucleic acids, and membranes. Topics include macromolecular structure-function relationships, nucleic acid structure and recognition, protein synthesis and folding, synthetic chemical biology, probes of cellular function, as well as modern approaches for target discovery and validation. In addition, the basic tutorial for Chemical Biology Tools (e.g., Codon Optimization Tool, NCBI-BLAST®, PyMOL) will be included as well.

There is no required textbook for this class. Material covered in lectures and supplementary reading will be the focus of the course. Reading lists will be distributed each week.
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The molecular visualization software PyMOL will be required after 6 weeks. This software can be downloaded *at no cost* to students and teachers using the following link: https://pymol.org/2/buy.html. Please note that a *three-button mouse* is required to use PyMOL to explore protein structure.

Instructor details:

Professor: Han Xiao

Communication with Professor Xiao: han.xiao@rice.edu

Course website: All PowerPoint slides and various course materials will be posted at our course website on Canvas, as well as class announcements, so check frequently. URL: https://canvas.rice.edu

Lectures: Mon/Wed/Fri 10:00-10:50 am in BRC 285

Exams: The midterm and final (1.5 hr) each constitute 50% of the final grade.

Topics covered, in their approximate order by week

1. History of Chemical Biology
2. Canonical Amino Acids
3. Special Lecture: Tools for Chemical Biology—KEGG Database
4. Noncanonical Amino Acids
5. Special Lecture: Tools for Chemical Biology—NCBI BLAST®
6. Protein structure and synthesis
7. Special Lecture: Tools for Chemical Biology—PyMOL
8. Bioorthogonal Chemistry
9. Protein Conjugation
10. Enzyme catalysis

EXAM #1

11. Nucleic acid structure and recognition
12. DNA Sequencing and Genome editing
13. Introduction to Glycoscience

EXAM #2